Review of the Bivalve Genus *Pholadomya* from the Tertiary of California and the Description of Two New Species

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(1 Plate)

THE GENUS *Pholadomya* is a common member of Mesozoic and early Cenozoic molluscan faunas, but becomes rare in later Cenozoic and Recent faunas. Detailed systematic study of fossil members of the genus is very difficult because of the generalized shell morphology and the thin shell is rarely preserved. Most fossil species of *Pholadomya* are known only from molds and casts.

Pholadomya is characterized by a small to medium sized, ovate to subtrigonal, thin-walled nacreous shell. The genus is strongly inequilateral with broadly rounded to subangular umbones located near the anterior margin of the shell. The ornamentation consists of prominent concentric undulations of varying strength. The anterior two thirds of the shell is generally decorated with narrow radial ribs which may or may not reach the ventral margin. The intersection of the radial and concentric ornamentation frequently results in the formation of low rounded nodes. Small delicate pustules cover the entire surface of the shell, but are only rarely preserved on fossil materials. The posterior gape is well developed, but varies considerably in width. The Recent type species (*P. candida* Sowerby) has a very weak hinge with a single obsolete tooth supported by a vertical buttress-like ridge below the beak in each valve (RUNNEGAR, 1972). The presence of a shallow depression in the hinge of each valve led Waterhouse to speculate that the depression was a ligamental pit. RUNNEGAR (1972) questioned Waterhouse's interpretation, but did not put forth any alternative function for the pits in the hinge plate.

Little is known about the ecology and life habits of the family Pholadomyidae. All Recent members of the family are rare, and most are restricted to deep water of the subantarctic region. Although exceedingly rare, *P. candida* Sowerby occurs in warm shallow waters of the West Indies (RUNNEGAR, 1972). Most of the California species appear to have lived in fairly deep water, but the occurrence of *P. nasuta* Gabb with shallow water assemblages in the Simi Hills indicates that the genus was not restricted exclusively to deep water habitats during the Tertiary. An examination of the shell morphology provides a number of clues to the ecologic requirements of the genus.

The thin elliptical, bluntly elongated shell with an extremely weak hinge is characteristic of a deep burrowing bivalve in a firm stable substrate (STANLEY, 1970). *Pholadomya* probably lives in a permanent burrow with an open siphonal tube to the surface. The general occurrence of fossil species in fine sandy siltstones with articulated valves supports this type of habitat.

The cosmopolitan genus *Pholadomya* first appeared in the Late Triassic and has survived to the Recent. Although a number of Recent species have been referred to *Pholadomya*, only *P. candida* Sowerby resembles the fossil forms. The other Recent small pholadomya-like bivalves, mainly from antarctic and subantarctic waters, probably belong to the genus *Panacca* Dall, 1905 or should be placed within a new genus.

The purpose of this note is to review the Tertiary species of *Pholadomya* from California. Except for the Paleocene species (*P. nasuta* Gabb), the genus is rare. In the Paleocene, the genus is represented by two species. *P. nasuta* Gabb is moderately abundant and occurs throughout the Paleocene. The other Paleocene species of pholadomyid (*P. **mounti*** n. sp.) is rare and known only from a single specimen collected by Charles E. Weaver from the basal Lodo Formation, Fresno County and 7 specimens from the "Martinez marine member" of the lower part of the Santa Susana Formation from the Simi Hills. Two species are known to occur in the Eocene. *P. **givensi*** n. sp. occurs in

the lower Middle Eocene Juncal Formation near Pine Mountain, Ventura County and *P. murrayensis* Hanna is known from a single specimen from the upper Middle Eocene of Rose Canyon, San Diego County. The only other known occurrence of the genus is *P. kernensis* Wiedey from the Middle Miocene Temblor Formation, Kern County.

Cooper (1896) in a short paper describing several new fossil mollusks from California referred a coarsely ribbed species from the Eocene to the genus *Pholadomya*. He further proposed a new subgenus (*Triplicosta*) based on this species. Cox & Newell (1969) questionably raised *Triplicosta* to generic rank in the Treatise. The radial sculpture of *P.* (*T.*) *progressiva* Cooper is not typical of the ornamentation of the Pholadomyidae. Instead of becoming obsolete on the dorsal posterior quarter of the shell, the ribs become progressively stronger. The relatively thick non-nacreous shell together with radial ornamentation indicates as Cooper suggested that *P.* (*T.*) *progressiva* Cooper probably does not belong to the Pholadomyidae, but to some veneroid such as *Cardita* or *Petricola*.

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The following abbreviations are used in the text:

A.N.S.P.: Academy of Natural Sciences, Philadelphia
U.C.M.P.: University of California Museum of Invertebrate Paleontology, Berkeley
U.C.R.: University of California, Riverside
L.S.J.U.: Leland Stanford Junior University

SYSTEMATIC PALEONTOLOGY

BIVALVIA

Pholadomyoida

Pholadomyacea

Pholadomyidae

Pholadomya Sowerby, 1823

Type: (by SD) *Pholadomya candida* Sowerby (*Pholadomya*) Sowerby, 1823, sensu stricto.

Subrectangular to ovate, umbones broad, low, located approximately one-eighth to one-quarter the length of shell from anterior margin; dorsal umbonal ridge present; escutcheon present or absent.

Geologic Range: Upper Triassic to Recent.

Pholadomya (*Pholadomya*) *nasuta* Gabb, 1864

(Figure 5)

Pholadomya nasuta Gabb, 1864; 1: 152; plt. 30, fig. 124; Stanton, 1896: 1024; Weaver, 1905: 116-117; plt. 12, fig. 6; Dickerson, 1914: 108, 151; plt. 9, figs. 1a, 1b; McLaughlin & Waring, 1915: fig. 13; Waring, 1917: 72; plt. 12, fig. 17; Clark, 1929: plt. 1, figs. 2, 7; Stewart, 1930: 301, 302; plt. 7, fig. 7; Schenck & Keen, 1940: plt. 19, fig. 1.

Holotype: A.N.S.P. no. 4562

Type locality: "On the shore of the Straits of Carquines, 2 miles west of Martinez" (Gabb, 1864).

Geographic distribution: Throughout the Paleocene of California.

Geologic range: Upper Paleocene. In the Simi Hills, it occurs within the planktonic foraminifera *Globorotalia pseudomenardii* (P_4) zone (Zinsmeister, 1975).

Discussion: This common species of *Pholadomya* is easily separated from other Paleocene pholadomyas of California by its large subrectangular outline and low rounded umbones. The posterior dorsal margin is only slightly concave. *Pholadomya (P.) murrayensis* Hanna also has a subrectangular outline, but the beaks are more centrally located and the posterior dorsal margin is distinctly concave. The ventral margin of *P. (P.) murrayensis* is not as broadly rounded.

Pholadomya (*Pholadomya*) *murrayensis* Hanna, 1927

(Figure 2)

Pholadomya murrayensis Hanna, 1927: 279; plt. 33, figs. 12, 13.

Holotype: U.C.M.P. no. 31150

Type locality: U.C.M.P. loc. 4229, elevation 325 feet at south side of road 0.19 inches west of the top of the "3" of B.M. 394, (La Jolla Quad.), north of Mission Valley, San Diego County, California (Hanna, 1927).

Geographic distribution: Known only from type locality.

Geologic range: upper Middle Eocene "Tejon Stage."

Discussion: This small distinctive species of *Pholadomya* from the late Middle Eocene has a more centrally located beak than either *P. (P.) nasuta* Gabb or *P. (P.) kernensis* Wiedey. The strong rectangular outline of the shell is not immediately apparent because the ventral margin is slightly crushed. The radial sculpture of *P. (P.) murrayensis* Hanna extends to the ventral margin and covers the anterior two thirds of the shell.

Pholadomya (Pholadomya) kernensis Wiedey, 1928

(Figure *4*)

Pholadomya kernensis Wiedey, 1928: 141-142; plt. 17, figs. 1, 2.

Holotype: L.S.J.U. no. 437, (Stanford's molluscan collections have been transferred to the California Academy of Sciences, San Francisco).

Type locality: L.S.J.U. loc. 438, SW 1/4 of SE 1/4 of Section 12, T. 27S., R. 28 E., north of Poso Creek, Kern County, California (Wiedey, 1928).

Geographic distribution: Known only from type locality.

Geologic range: Middle Miocene, Temblor Formation.

Discussion: *Pholadomya (P.) kernensis* Wiedey is similar in size to *P. (P.) nasuta* Gabb, but may be distinguished by its slightly more elongated outline, narrower anterior margin, sharper beak, and a wider gape. The radial ribs are fewer in number and tend to become obsolete near the ventral margin. Posterior to the central radial ribs on *P. (P.) kernensis* Wiedey are 3 to 4 narrow widely spaced continuous ribs.

(*Bucardiomya*) Rollier in Cossman, 1912

Type: (by SD) *Pholadomya bucardium* Agassiz.

Subtrigonal to obliquely oval, umbones high, prominent, subangular, located near anterior margin, escutcheon absent.

Geologic range: Lower Jurassic to Lower Tertiary.

Pholadomya (Bucardiomya) ***mounti*** Zinsmeister, spec. nov.

(Figures *3, 6, 7*)

Description: Shell thin walled, moderately inflated, subtrigonal, markedly inequilateral. Beaks elevated, subangular, located near anterior margin. Posterior dorsal margin slightly to moderately concave; anterior margin nearly straight; posterior and ventral margin broadly rounded. Sculpture – numerous well developed irregularly spaced concentric undulations; radial ribs (6 to 12) extend to ventral margin, restricted to anterior two thirds of shell; small blunt nodes formed by intersection of radial ribs and concentric undulations.

Dimensions: Holotype no. U.C.R. 6898/101, length 46 mm; height 40 mm; Paratype U.C.R. no. 6899/4, length 30 mm, height 28 mm; Paratype U.C.R. no. 6898/102, length 36 mm (incomplete), height 49 mm.

Type locality: U.C.R. loc. 6898, medium brown, fine grained sandy siltstone at bottom of steep road cut, 2 790 feet 34° SW of hill 1331; 3 675 feet 11° SE of SW corner of Section 14, T. 2 N., R. 18 W. (Zinsmeister, 1974).

Geographic distribution: Fresno County south to Ventura County, California.

Geologic range: Paleocene.

Discussion: *Pholadomya (Bucardiomya)* ***mounti*** is distinguished from *P. (B.)* ***givensi*** by its large size, concave posterior margin and broadly rounded anterior margin. The radial ribs of *P. (B.)* ***mounti*** extend to the ventral margin while those of *P. (B.)* ***givensi*** tend to become obsolete.

Explanation of Figures *1* to *7*

Figure *1*: *Pholadomya (Bucardiomya) givensi* Zinsmeister, spec. nov. Holotype U. C. R. 4662/110; lower Middle Eocene, Pine Mountain, Ventura County, California X 1

Figure *2*: *Pholadomya (Pholadomya) murrayensis* Hanna, Holotype U. C. M. P. 31150, upper Middle Eocene, San Diego County, California X 1.5

Figure *3*: *Pholadomya (Bucardiomya) mounti* Zinsmeister, spec. nov. Paratype U. C. R. 6899/4; Upper Paleocene, Simi Hills, Ventura County, California X 1

Figure *4*: *Pholadomya (Pholadomya) kernensis* Wiedey. Holotype L. S. J. U. 437, north of Poso Creek, Kern County, California X 1

Figure *5*: *Pholadomya (Pholadomya) nasuta* Gabb. Hypotype, U. C. R. 6813/4; Upper Paleocene, Simi Hills, Ventura County, California X 1

Figure *6*: *Pholadomya (Bucardiomya) mounti* Zinsmeister, spec. nov. Paratype U. C. R. 6898/102; Upper Paleocene, Simi Hills, Ventura County, California X 1

Figure *7*: *Pholadomya (Bucardiomya) mounti* Zinsmeister, spec. nov. Holotype U. C. R. 6898/101; Upper Paleocene, Simi Hills, Ventura County California X 1

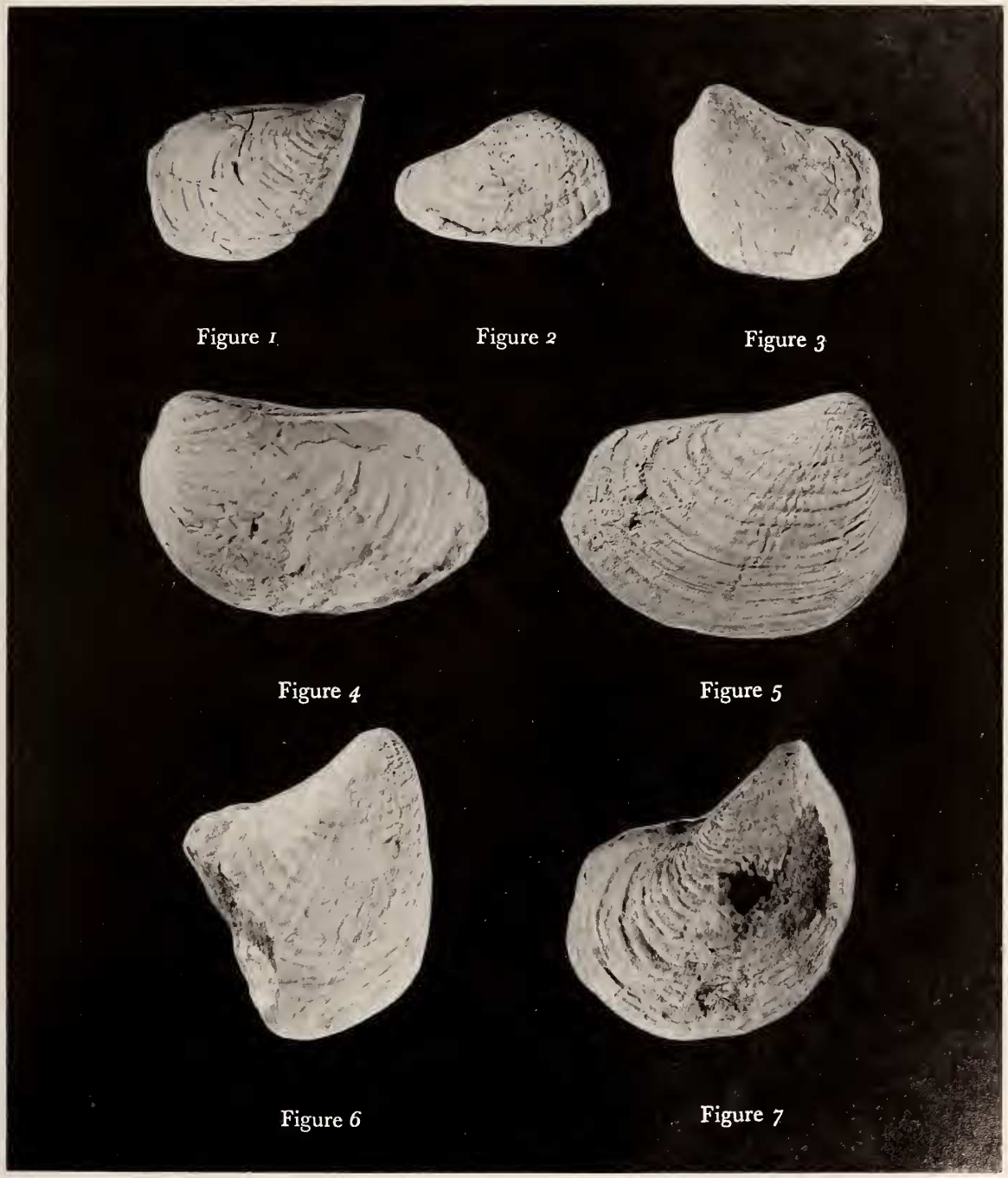

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7